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CANADIAN COMMITTEE ON OCEANOGRAPHY

PROPOSED FIVE-YEAR PROGRAM

by

H. B. HACHEY,
Secretary,
Canadian Committee on Oceanography

APPROVED BY THE CANADIAN COMMITTEE ON OCEANOGRAPHY, AT ITS ANNUAL MEETING HELD APRIL 8TH, 1960, AT OTTAWA, ONTARIO

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Mr. P. W. Nasmyth, Director, Maritime Services, Defence Research Board,

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Dr. D. C. Rose, Division of Pure Physics, National Research Council,

Dr. G. W. Stead, Assistant Deputy Minister (Marine), Department of Transport.

Secretary: Dr. H. B. Hachey, Chief Oceanographer, Fisheries Research Board of Canada.

OTTAWA,
Canada

Errata : Should read :
Dr.W.E. van Steenburgh, Director-General, Scientific Services, Department of Mines and Technical Surveys
Mr. P.W. Nasmyth, Director, Maritime Research, Defence Research Board

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F O R E W O R D

The proposed five-year program outlined herein is a preliminary attempt to summarize the planning of the various co-operating organizations under the Canadian Committee on Oceanography. As indicated, the contributions of the co-operating organizations will be determined by each individual agency in accordance with its authorities and responsibilities as established by the Canadian Government.

It is recognized that the best progress can be obtained by co-operative efforts, and hence the advisability of putting forward a proposed five-year program which may require modification from time to time.

O T T A W A,
April 8, 1960.

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Introduction :

Under the developing plans of several federal agencies, national activities in oceanography will be accelerated during the next five years. All of these activities will be co-ordinated under the Canadian Committee on Oceanography.

The Canadian Committee on Oceanography is a co-ordinating and advisory body representing the following organizations :

The Royal Canadian Navy,
The Fisheries Research Board,
The Department of Mines and Technical Surveys,
The Defence Research Board,
The National Research Council,
The Meteorological Branch, Dept. of Transport,
The Marine Services, Department of Transport,
The Institute of Oceanography, University of British Columbia,
The Institute of Oceanography, Dalhousie University,
The Department of Geological Sciences, University of Toronto.

Functions :

The functions of the Committee are to :

(a) Co-ordinate the oceanographic activities of all Canadian Government agencies.

(b) Act, as designated by the National Research Council, as the national committee for the Scientific Committee on Oceanographic Research (SCOR).

(c) Act, as designated by the National Research Council, as the Section on Oceanography of the NRC Associate Committee on Geodesy and Geophysics.

Each of the co-operating organizations is either actively engaged in oceanographic investigations or contributes in ships, laboratory facilities, personnel or funds towards the overall Canadian program. The total effort is co-ordinated through the Committee.

Working Groups East and West Coasts and Great Lakes :

A Working Group has been established on the West Coast and Working Groups are being established on the East coast and on the Great Lakes to develop such liaison and co-operation among the agencies concerned as is needed to best attain their respective objectives and the maximum utilization of facilities, and specifically to :

(a) Arrange for the co-ordination of programs when appropriate.

(b) Program research ship time when or where ships are available for shared use amongst two or more of the agencies concerned.

(c) Foster the co-operative use, as feasible, of special facilities or equipments available in the individual agencies.

(d) Consider the oceanographic and limnological programs in areas of responsibility, and give opinions and recommendations concerning them to the CCO.

Working Group on Ice in Navigable Waters :

The Working Group on ice in navigable waters was set up under the Joint Committee on Oceanography (now the Canadian Committee on Oceanography) to co-ordinate and encourage research in the field of ice in navigable waters. Particular attention has been given to the following activities :

(a) The development of techniques for forecasting, ice growth, degeneration and movement.

(b) Studies of the physical properties of ice.

(c) Studies of the dynamics of the ice-air and ice-water interfaces.

(d) Climatological studies.

(e) The promotion of a standard terminology and codes for reporting ice.

National Responsibilities :

While the contributions of the co-operating organizations will be determined by each individual agency in accordance with its authorities and responsibilities as established by the Canadian Government, general areas of prime responsibility and co-operation are indicated in the attached Table I.

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Aims of Canadian Oceanography :

The aims of Canadian oceanography are to :

(a) Fulfill national requirements for a knowledge of the waters of the oceans on our three coasts and inland seas.

(b) Increase the knowledge of our continental shelf and the mineral potential of the sediments in continental waters.

(c) Fulfill international obligations in the study of the world oceans.

In order to further these aims it is necessary to :

(a) Observe, describe, and explain the oceanographic conditions in waters of Canadian interest, east, north, and west.

(b) Study the various phenomena of the oceans and inland seas as related to fisheries, transportation, meteorology, marine geology, defence, and other items of national interest.

(c) Contribute as appropriate to international planning and activities in a study of the World Oceans.

(d) Ensure a sound and productive effort by furthering fundamental research in all ocean processes.

Major Requirements :

(a) Fisheries : Oceanography for fisheries is a study of environments and of the fundamental processes in oceans that relate to these environments. The well-being of the major fisheries on the Atlantic and Pacific coasts and in the Great Lakes are of international concern, and related problems are being given attention by several international commissions. Canada is committed to a major part in these international studies. A host of problems of wholly national concern also require attention. In the Arctic, the chief interest in fisheries is in relation to food supplies for our Eskimo population. The prime responsibility of the Fisheries Research Board in oceanography is that related to fisheries, and since 1910 the Board has been active in this field. Since World War II, the Board has accepted responsibilities relative to other national interests in oceanography in the Atlantic, the Arctic, and the Pacific. It is the general policy of the Fisheries Research Board, in the co-operative planning in oceanography to gradually revert to the oceanographic

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interests of prime responsibility. It is the intention to contribute as much as possible during the next five years to the over-all national program in oceanography and to accept other temporary responsibilities where required. This is particularly pertinent while the Department of Mines and Technical Surveys is developing to the stage where it will assume prime responsibility for ocean surveys and for defence oceanography. Such a policy involves very close co-operative planning with the Department of Mines and Technical Surveys, loaning of professional oceanographers, and assistance in the training of technical personnel.

(b) Defence : An important and primary task in oceanography is to meet the demands of the Department of National Defence. The Department of Mines and Technical Surveys will ultimately assume responsibility for satisfying the requirements arising from defence. It will extend and increase research into deeper Atlantic waters and northern areas, arriving at sufficient understanding of the oceanographic systems to forecast oceanographic variables important in anti-submarine warfare. The Canadian Committee on Oceanography, as the co-ordinating agency for the various departments it represents, has agreed that it will endeavour to ensure that adequate emphasis is placed on meeting the requirements of the Department of National Defence by their joint efforts, shifting the prime responsibility for such oceanographic research and survey to the Department of Mines and Technical Surveys as soon as that Department is in a position to accept it. It is expected that the Fisheries Research Board will continue to try to meet the general national requirements in the Pacific area pending the extension of the Department of Mines and Technical Surveys' oceanographic activities in this area.

(c) Ice : The Meteorological Branch of the Department of Transport has the prime responsibility for ice observing and forecasting, and the inter-relations of this field with physical oceanography. Of specific related interest is navigation in the Gulf and River St.Lawrence, the Great Lakes, Hudson Bay and Strait and the Canadian Arctic. The Meteorological Branch will depend upon the research of its own research organization, the Department of Mines and Technical Surveys, the Fisheries Research Board, the National Research Council, and the Defence Research Board for the elucidation of the oceanographic, limnological, meteorological, and climatological variables involved in forecasting. The transfer of heat, both from the atmosphere and the underlying waters, will be studied, and the effect of the currents on ice distribution will be delineated. The Defence Research Board will continue, in co-operation with the National Research Council, to further research on the physical properties of ice, both fresh and sea water, and will maintain its interest in

developing a Canadian Standard Terminology for ice reporting in keeping with International Standards. The National Research Council will continue to conduct various studies on the formation of frazil ice and anchor ice in the St. Lawrence River and Estuary, and will continue with model studies of the Gulf of St. Lawrence.

The Marine Services Branch of the Department of Transport fulfills the requirements of the Department relative to navigation, and specifically in relation to the ice problems in the Gulf and River St. Lawrence, and the ice problems in supplying Northern outposts. For all these activities the department operates several ice-breakers. These ice-breakers are the types of ocean-going platforms from which scientific studies of ice and ice-infested waters can be prosecuted. The requirements for such platforms will gradually increase during the next five years, and in particular it is not difficult to forecast that full time use of one ice-breaker will be needed to meet the requirements arising from the studies outlined above, and the specific requirements of the Department of Mines and Technical Surveys.

(d) Marine Meteorology : The study of the inter-actions between the ocean and the atmosphere is a field for close co-operation between oceanographers and meteorologists. For the meteorologist, the oceans on all three coasts, and our inland seas introduce parameters that have an important bearing on weather forecasting. For the oceanographer, the study of oceanographic conditions will eventually lead, as in meteorology to methods of forecasting. When practical, and this is something for the future, it would appear that the actual forecasting of oceanographic conditions could be within the capabilities of the Meteorological Branch of the Department of Transport.

(e) Submarine Geology : Basic information is required on the geological structures of the land masses of the continental shelf, and of the sediments which cover them. The Department of Mines and Technical Surveys will develop a program of submarine geology to obtain a more complete knowledge of the geology of the country, and to elucidate the mineral resources of the continental shelf and the sediments of the larger bays and channels. Special attention will be directed to the fundamental problems of the mud-water interface on the ocean floor, involving chemical, physical, biological, and bacteriological studies in this very important field.

(f) Deep Water Characteristics : The increasingly serious problem of the disposal of radioactive wastes at sea

demands much more reliable knowledge of the age and turnover of deep oceanic water than is at present available. This involves studies of deep ocean circulation, and the Department of Mines and Technical Surveys may be expected to undertake appropriate research in the Atlantic within the five-year period of the present program.

(g) Education : At this stage of developments in oceanography in Canada, a most serious shortage of professional oceanographers exists, particularly in the physical and chemical disciplines. It is expected that as the present developments in oceanography gradually come to fruition over the next five years, the required basic staffs can be built up with professional oceanographers who might be attracted from other areas, with repatriated Canadian professionals, and with graduates from the Institutes of Oceanography at the University of British Columbia and Dalhousie University, and from other Canadian universities such as Toronto and McGill, offering specialized training in fields relating to oceanography. Where necessary, the National Research Council and the Defence Research Board provide financial assistance to ensure adequate staff and vigorous research programs at these specialized centres.

(h) International Liaison : Oceanography is international in character. The National Research Council is responsible for assuring international liaison in oceanography. This is furthered through the National Committee for SCOR (Scientific Committee on Oceanographic Research), and through the Associated Committee on Geodesy and Geophysics. As indicated earlier, the Canadian Committee on Oceanography has been designated by the National Research Council as the National Committee for SCOR, and as the Section on Oceanography of the Associate Committee on Geodesy and Geophysics.

Areas for Increased Emphasis :

The areas requiring increased emphasis are the waters of the Western North Atlantic, the sub-Arctic and the Arctic Archipelago. The first endeavour to meet this requirement, must be to extend studies southward, eastward, and northward from the Canadian areas that have received most attention in the past. This will involve extended surveys southward and eastward to ocean depths, extension northward into the Labrador Sea, Davis Strait, Baffin Bay and greater attention to Hudson Strait, Foxe Basin and Hudson Bay.

In the Arctic, the Polar Continental Shelf Project which has been organized under the Department of Mines and Technical Surveys to obtain a thorough and accurate understanding of the distribution, extent, composition, movement and history of oceanic waters lying to the north of the mainland of Canada, will gradually extend southward and eastward through the Archipelago. An important

aspect of this project's activity will be the study of changes in one or more representative areas over the complete Arctic season. Though probably not within the present five-year plan, ship-borne teams from the east, will work north and westward eventually merging with the land-based teams of the Polar Continental Shelf Project.

In the Great Lakes, problems in limnography, closely allied to oceanography, arise in connection with fisheries meteorology, water levels, and transportation. The Fisheries Research Board is heavily involved in fishery problems that are international in scope. Studies of the environment are involved. At present limnological research is being furthered here by Federal Departments of both the United States and Canada and by the Great Lakes Geophysical Research Group. The Department of Mines and Technical Surveys is responsible for hydrographic and associated investigations of tides and inland water levels. In this latter area it becomes involved in limnography. It would appear that with the increasing problems of the fisheries and with the operation of the St. Lawrence Deep Sea Waterway, the Great Lakes will require greater attention.

The Co-operative Five-Year Program :

The co-operative five-year program in oceanography is given in some detail in the attached Table II.

Requirements in Laboratories, Ships and Personnel :

The requirements for laboratories, ships and personnel are indicated in the attached Table III.

H. B. Hachey,
Secretary,
Canadian Committee on Oceanography.

O T T A W A,
April 8, 1960.

TABLE I. NATIONAL RESPONSIBILITIES IN OCEANOGRAPHY

Field	Responsibility	Studies Involved	Other Co-operating Agencies
Education and Fundamental Research	NRC, Universities and Institutes	Those furthered by IOUBC, IODAL, Great Lakes Geophysical Institute, etc.	Those under the Canadian Committee on Oceanography
International Oceanography	NRC	As organized under the Scientific Committee for Oceanographic Research (SCOR). (Note : There are other activities in oceanography organized under international commissions or bodies such as NATO, ICNAF, INPFC, and WMO).	Various federal agencies represent Canada on International Commissions and World Organizations. The Canadian Committee on Oceanography has been designated by NRC as the National Committee for SCOR.
Fisheries Oceanography	FRB	Marine biology, productivity, environments, fundamental processes. Physical, chemical, geological and biological studies of the oceans of particular significance to fisheries. Atlantic, Arctic and Pacific.	DM & TS, DOT, RCN, contributing to general oceanography, deep ocean studies, tides and currents, mapping, and charting, marine meteorology, and ice studies. Provision of oceanographic ships. Also Province of Quebec.
Defence Oceanography	DM & TS	Physical, chemical oceanography and submarine geology in relation to maritime warfare. Special emphasis on forecasting sonar conditions.	FRB; DOT for marine meteorology, ice forecasting, and provision of ice breakers; DRB, RCN and RCAF. (FRB particularly involved in the Pacific).
Arctic Oceanography	DM & TS	Marine geology, seismology, marine biology, gravity, magnetism, sea-ice, hydrography, surveying, and physical and chemical oceanography.	FRB; DOT for marine meteorology, ice forecasting, and provision of ice breakers.
Deep Ocean	DM & TS	General oceanography.	DOT with Weathership, RCN, DRB. (FRB particularly involved in Pacific).
Ice Studies	(a) DOT	Ice observing and forecasting. Inter-relations with physical oceanography. Climatological studies. Winter navigation.	DM & TS, FRB, NRC, DRB. The Geographic Branch (DM & TS) is developing a historical picture of ice.
	(b) DRB	Physical properties of sea ice. Standard terminology.	DRB with DM& TS is publishing an Ice Atlas.
	(c) DM & TS	Ice growth and degeneration and general oceanography relative to ice.	DRB is conducting studies of ice growth and degeneration in Hudson Bay and St. Lawrence area.
	(d) DOT and Great Lakes Institute	Ice growth and degeneration and general limnology of the Great Lakes.	NRC is conducting laboratory and field studies of fresh water ice.
Tides, Currents, Maps and Charts	DM & TS	Fundamental studies of tides and currents. Charting and mapping.	DOT in marine meteorology.
Inland Seas (Great Lakes)	DM & TS & FRB	Water levels etc.; physical-chemical limnography; limnology; geological studies.	Great Lakes Institute; also Province of Ontario.
Special Studies (breakwaters and harbours, ice in rivers)	NRC	Model and field studies. Fundamentals of frazil and anchor ice.	DM & TS

TABLE II. CO-OPERATIVE OCEANOGRAPHIC FIVE-YEAR PLAN

Area	National Requirements	Projects	Remarks
Arctic	Navigation relative to re-supply, industrial potential, and defence. Marine resources. Responsibility in the Arctic Basin.	Ice studies. Tides and currents. Physical and chemical properties of the waters. Geology and bottom characteristics. Polar Continental Shelf. Marine biology.	Large amount of work to be done. Some of high priority.
Baffin Bay Labrador Sea, Newfoundland Waters	Navigation, marine resources, and defence. Commitments, under International Commission Northwest Atlantic Fisheries (ICNAF)	Fundamentals of Labrador Current. Physical and chemical properties of the waters. Distribution of Arctic waters southward. Marine biology. Ice Studies.	Area of national as well as of international importance. More than a dozen countries prosecuting the fishery.
Hudson Bay James Bay	Navigation, marine resources, submarine geology.	Physical and chemical properties of the waters, marine biology, ice studies, heat budgets and submarine geology.	Large amount of work to be done.
Gulf of St. Lawrence, St.lawrence River	Navigation, marine resources, and defence. Commitments, under ICNAF.	Ice studies. Physical and chemical properties of the waters. Marine biology. Problems of Belle Isle Strait. The Gaspe Current. Submarine geology and geo-chemistry of sediments. Tides, currents, seas and swells.	Increasing industrial importance with specific attention required in problems of ice and winter navigation.
Scotian Shelf Bay of Fundy	Navigation, marine resources, and defence. Commitments under ICNAF.	Physical and chemical characteristics of the waters. Studies of the mud-water interface. Fundamentals of Gulf Stream and Slope water. Tidal problems.	An area of co-operation involving the Oceanographic Institute at Dalhousie University.
Northwest Atlantic	Defence	Organization and studies of available data. Extended ocean cruises.	Close co-operation among FRB, DM & TS, Met. Service and DND required to elucidate controlling variables for forecasting A/S warfare environmental conditions. When practical, DOT (Meteorological) will have responsibility for forecasting.
Deep Ocean Atlantic	Canadian contribution to studies of world oceans. Defence. Responsibilities to UNESCO.	Ocean circulation as related to neighboring North American waters. Age of deep waters relative to disposal of radioactive wastes. Turbidity currents. Relation of oceanography to accoustic detection by deep sound paths.	Awaits availability of planned ocean-going oceanographic ship.
Deep Ocean Pacific	Canadian contribution to studies of world oceans.	Ocean circulation as related to neighboring North American waters. Age of deep waters relative to disposal of radioactive wastes. Mathematical studies of wind and transport. Relation of oceanography to acoustic detection of deep sound paths.	Suitable ship not available at present.
North Pacific	Marine resources and defence. Commitments under International North Pacific Fisheries Commission.	Physical and chemical properties of the waters. Fundamentals of circulation, upwelling, and productivity. Studies from Ocean Weathership. Organization and studies on available data relative to defence. Energy exchanges between sea and atmosphere.	FRB to carry weight of investigations. DOT (Meteorological) developing studies in energy exchange. Responsibilities for A/S warfare environmental conditions the same as for Northwest Atlantic.
Coastal Pacific	Marine resources and defence.	Special surveys of limited areas for specific problems.	FRB with the co-operation of DND will carry the responsibility.
Inland Seaways (Pacific)	Navigation, marine resources and defence. Pollution problems.	Tides and currents, physical and chemical properties. Marine biology and geology. Pollution studies. Studies with models.	An area for close co-operation between FRB, DRB, DM & TS and IOUBC.
Great Lakes	Navigation, water levels, physical and chemical limnography, fisheries, water resources, water pollution, submarine geology, ice studies.	Water levels, shore erosion, pollution, fisheries, geology.	Co-operative efforts under development.
Special Projects	Shore structures, pipe lines, power lines, industrial chemistry, tidal power, canals, causeways, radioactivity, model studies, sea and swell.	Set up as required.	Responsibility as indicated by the type of problem.

TABLE III.

REQUIREMENTS IN LABORATORIES, SHIPS AND PERSONNEL

Laboratories :

The additional requirements for the next five years are being met under DM & TS plans for the Bedford Institute.

Ships Oceanographic :

The requirements for the next five years in oceanography are being met by :

(a) The operation by the RCN of one ship on each coast for oceanographic research.

(b) The operation of the present hydrographic fleet of DM & TS and the construction of C.G.S. "Hudson". Four chartered ships to DM & TS. Authorization for the planning of three other oceanographic-hydrographic vessels is covered by the 1960-61 estimates.

(c) The operation of C.G.S. "Labrador" by DOT and the availability of other ships of the fleet.

(d) The operation of ships of FRB including the "A.T. Cameron" and the proposed "G.B. Reed".

(e) Weathership operation.

Attention is directed to the needs in the Great Lakes, IOUBC and IODAL. Attention is also called to the fact that except for the RCN ships in (a) above, only a portion of ships' time is available for oceanography.

Personnel :

FRB : The requirements for personnel are in the professional and technician classifications. The oceanographic staff of the Fisheries Research Board now numbering 42, (19 professional) will probably require augmentation by 15% over the next five years.

DM & TS : Exclusive of Hydrographic requirements

43 Professional
85 Technical

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